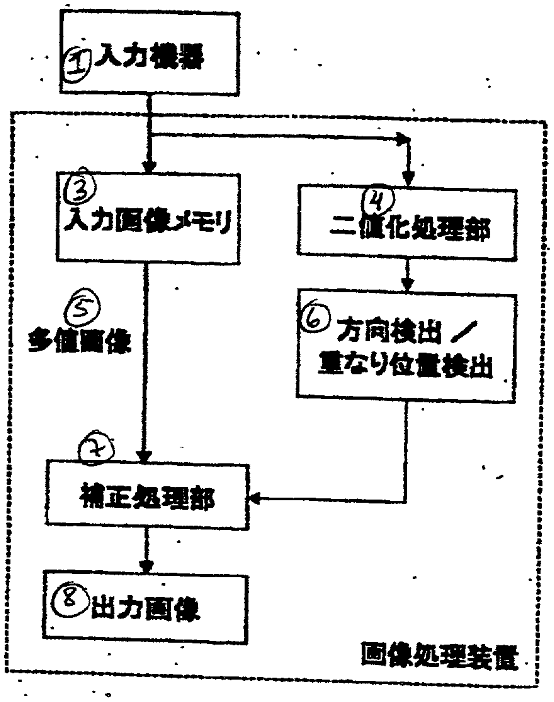
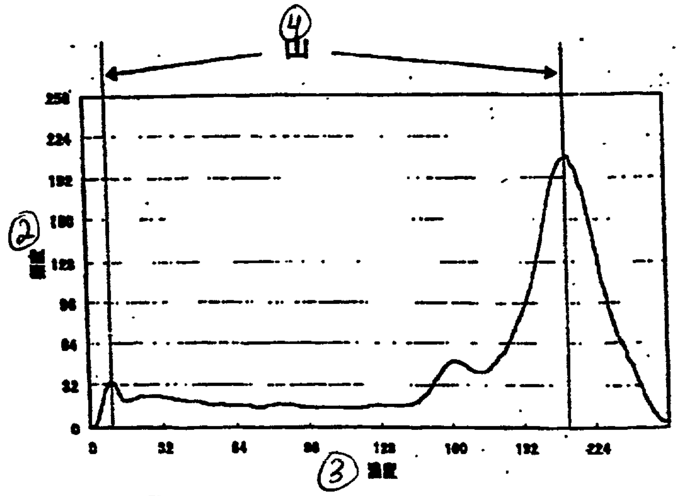
Figure 1


① 入力機器
③ 入力画像メモリ
④ 二値化処理部
⑤ 多値画像
⑥ 方向検出／重なり位置検出
⑦ 補正処理部
⑧ 出力画像
画像処理装置

[(1): Input machine; (2): Image processing device; (3): Input image memory; (4): Binarization unit; (5): Multivalent image; (6): Direction detection/overlap position detection; (7): Calibration unit; (8): Output image]

Character

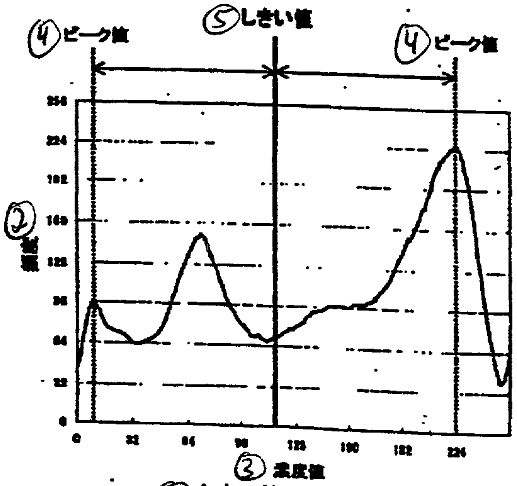
Figure 2



① ヒストグラム上に2つの山ができた例.

[(1): Case where two peaks have arisen on a histogram; (2): Frequency; (3): Density; (4): Peak]

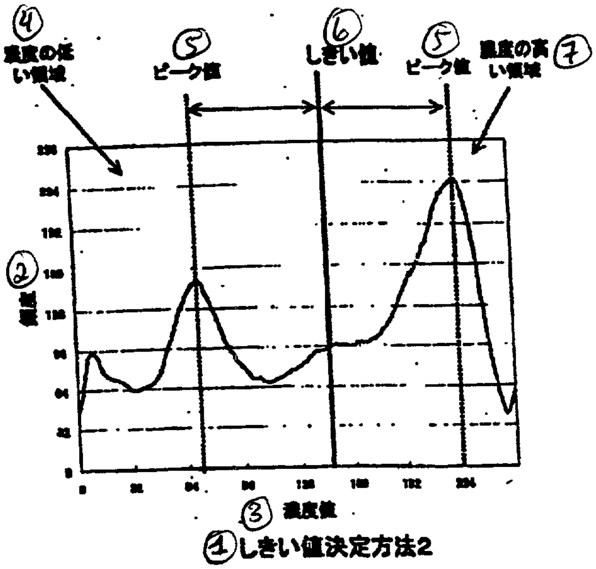
Figure 3



① しきい値決定方法1

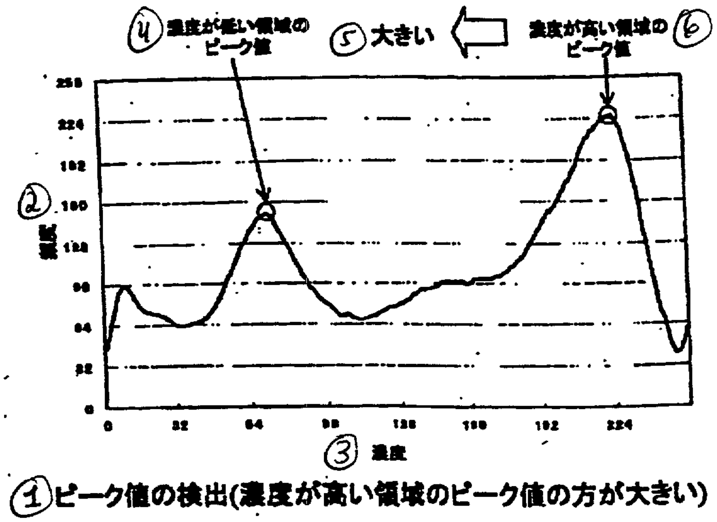
[(1): Threshold value determination method 1; (2): Frequency; (3): Density; (4): Peak value; (5): Threshold value]

Figure 4



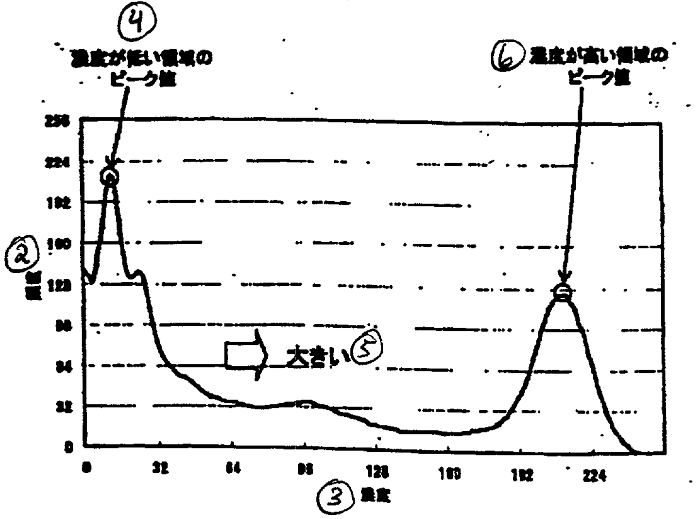
[(1): Threshold value determination method 2; (2): Frequency; (3): Density; (4): Low-density region; (5): Peak value; (6): Threshold value; (7): High-density region]

Figure 5



[(1): Peak value detection (higher peak value in the high-density region); (2): Frequency; (3): Density; (4): Low-density region peak value; (5): Higher; (6): High-density region peak value]

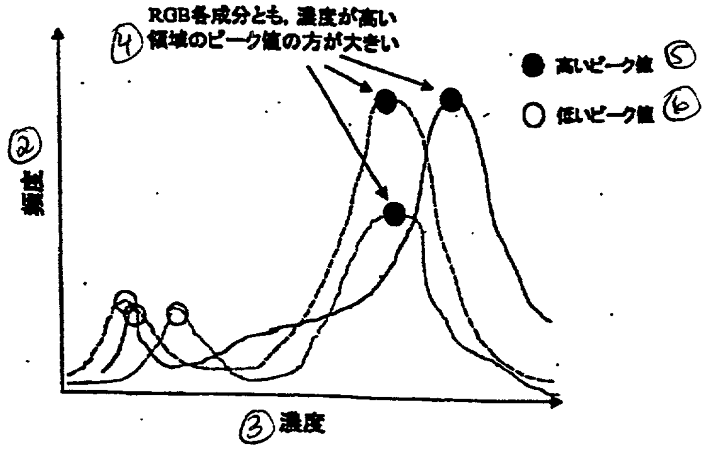
Figure 6



①ピーク値の検出(濃度が低い領域のピーク値の方が大きい)

[(1): Peak value detection (higher peak value in the low-density region); (2): Frequency; (3): Density; (4): Low-density region peak value; (5): Higher; (6): High-density region peak value]

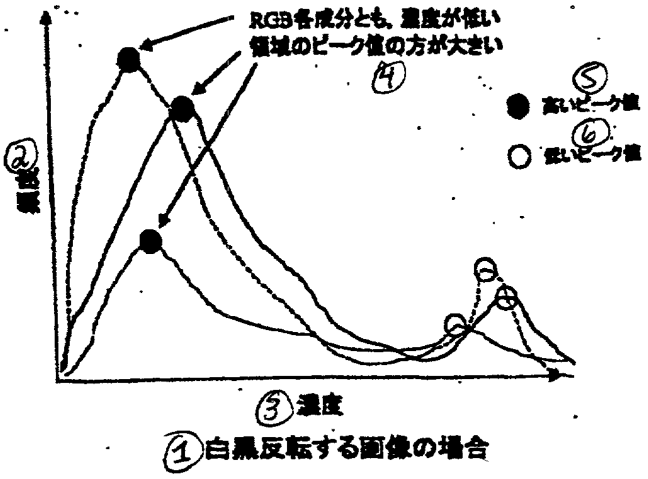
Figure 7



①白黒反転無しの画像の場合

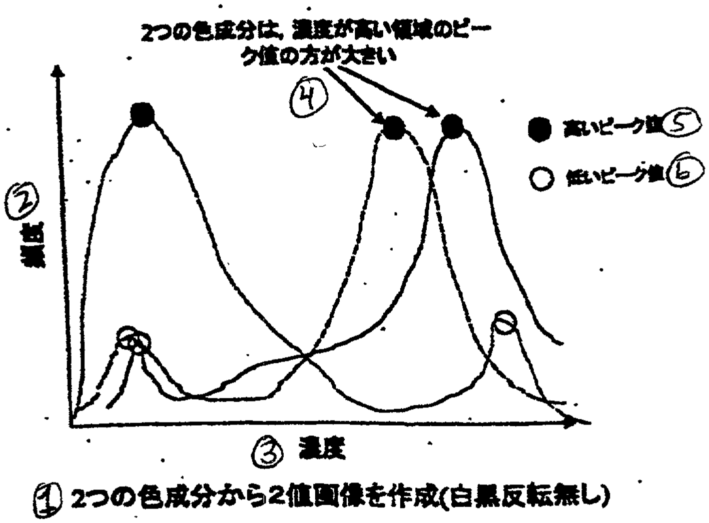
[(1): Case of non-white/black-permutated image; (2): Frequency; (3): Density; (4): Higher peak values in the high-density region with regard to all components R, G, and B; (5): High peak value; (6): Low peak value]

Figure 8



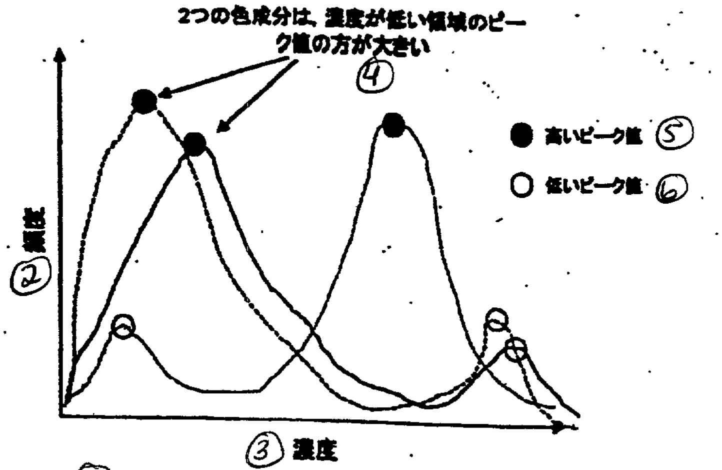
[(1): Case of non-white/black-permutated image; (2): Frequency; (3): Density; (4): Higher peak values in the high-density region with regard to all components R, G, and B; (5): High peak value; (6): Low peak value]

Figure 9



[(1): Preparation of binary image from two color components (white/black permutation absent); (2): Frequency; (3): Density; (4): Higher peak values in the high-density region with regard to two color components; (5): High peak value; (6): Low peak value]

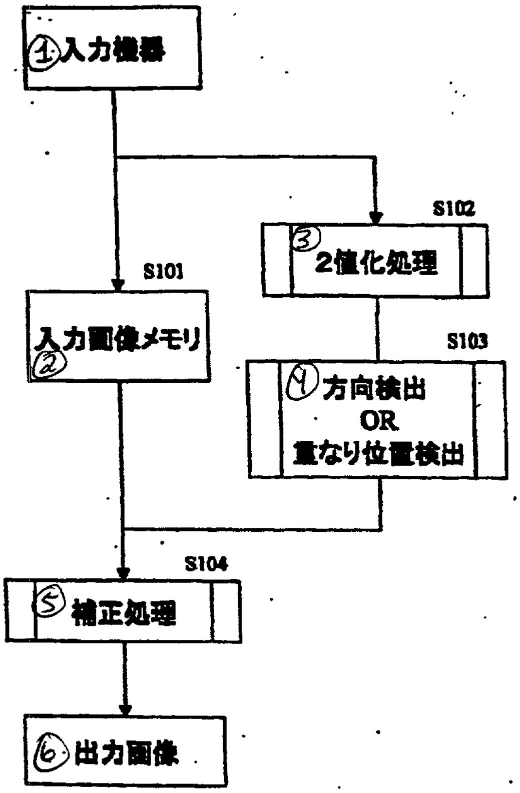
Figure 10



①2つの色成分から2値画像を作成(白黒反転)

[(1): Preparation of binary image from two color components (white/black permutation present); (2): Frequency; (3): Density; (4): Higher peak values in the low-density region with regard to two color components; (5): High peak value; (6): Low peak value]

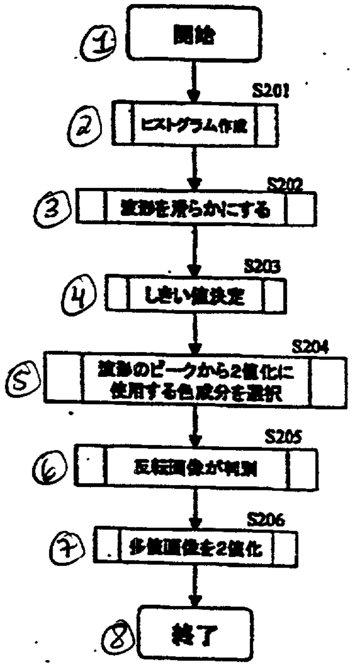
Figure 11



①入力機器
S101
入力画像メモリ
②
S102
③2値化処理
S103
④方向検出
OR
重なり位置検出
S104
⑤補正処理
⑥出力画像

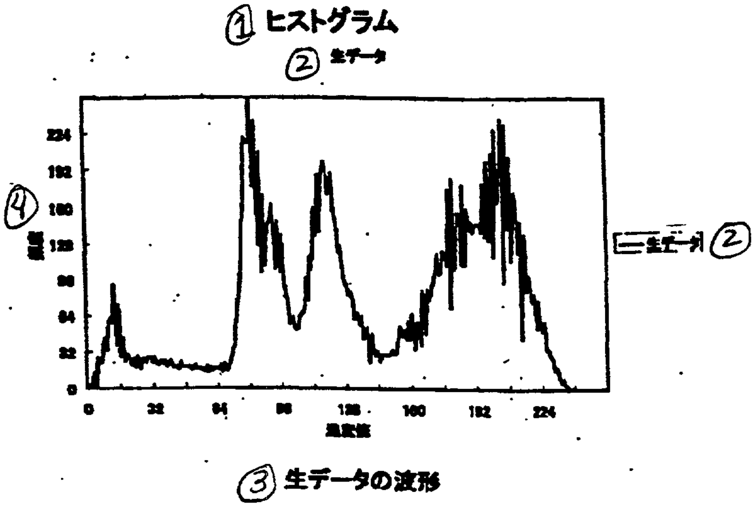
[(1): Input machine; (2): Input image memory; (3): Binarization routine; (4): Direction detection or overlap position detection; (5): Calibration routine; (6): Output image]

Figure 12


①
開始
S201
②
ヒストグラム作成
S202
③
波形を滑らかにする
S203
④
しきい値決定
S204
⑤
波形のピークから2値化に使用する色成分を選択
S205
⑥
反転画像が判別
S206
⑦
多値画像を2値化
⑧
終了

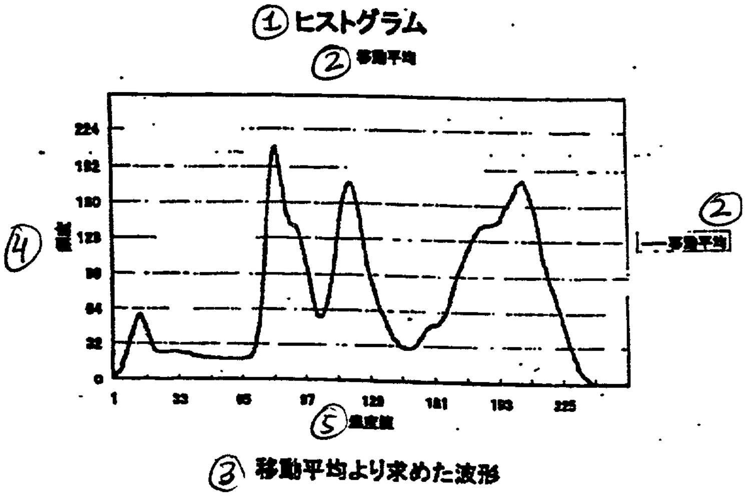
[(1): Begin; (2): Histogram preparation; (3): Wave shape flattening; (4): Threshold value determination; (5): Selection of a color component to be used for binarization based on the wave peak; (6): Judgment of image permutation; (7): Binarization of multivalent image; (8): End]

Figure 13



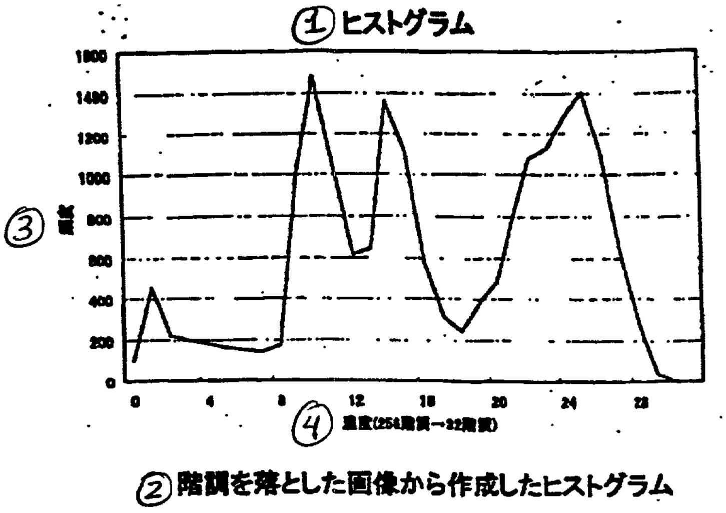
[(1): Histogram; (2): Raw data; (3): Density value; (4): Frequency]

Figure 14



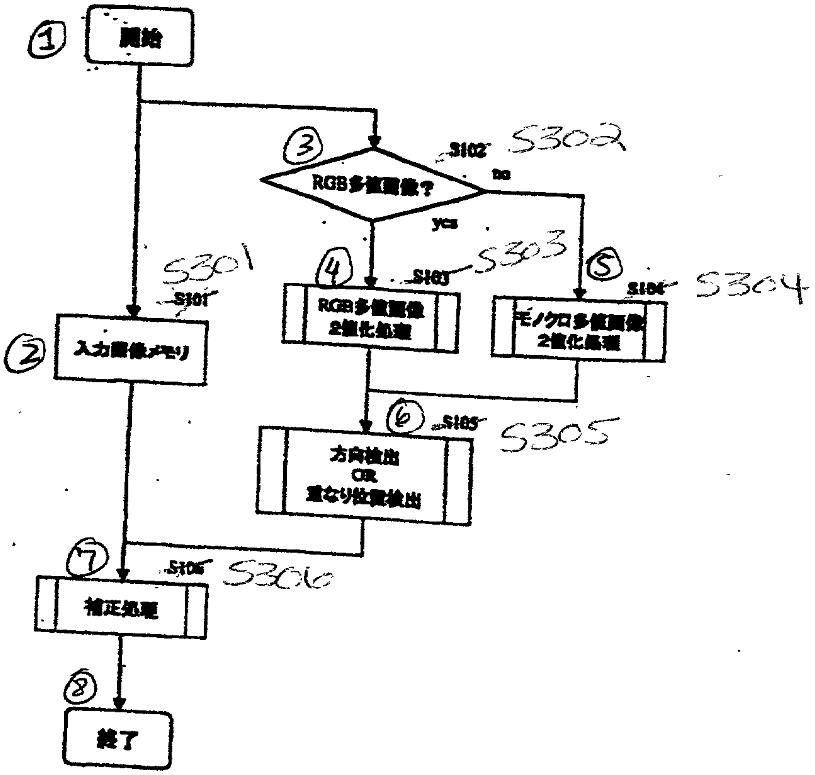
[(1): Histogram; (2): Mobile average; (3): Wave shape calculated based on the mobile average; (4): Frequency]

Figure 15



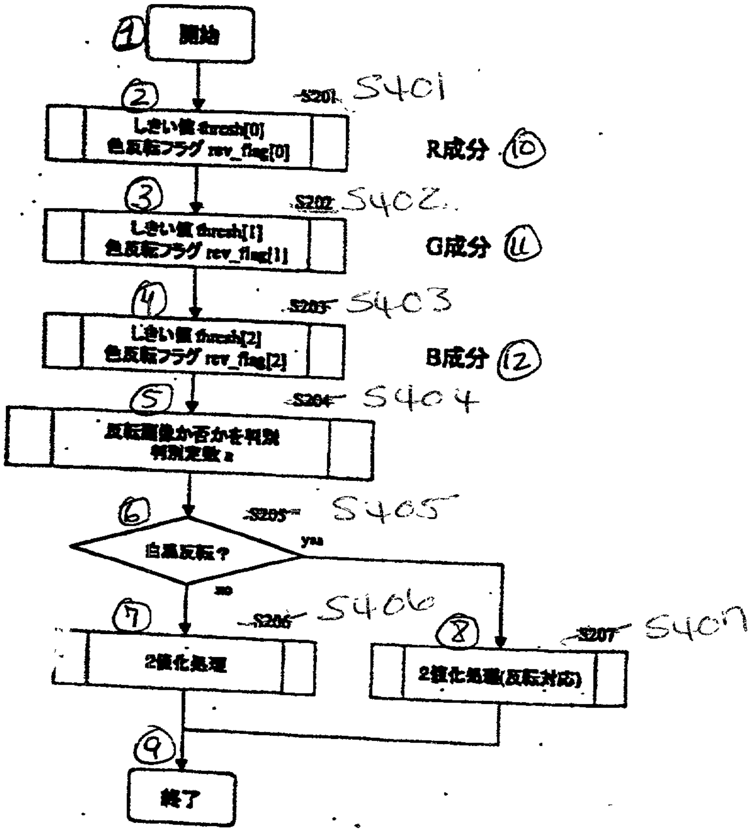
[(1): Histogram; (2): Histogram prepared from a tone-downgraded image; (3): Frequency; (4): Density (256th tone -> 32nd tone)]

Figure 16


①
開始
③
S102
S302
RGB多値画像？
no
yes
S301
S101
②
入力画像メモリ
④
S103
S303
RGB多値画像
2値化処理
⑤
S104
S304
モノクロ多値画像
2値化処理
⑥
S105
S305
方向検出
OR
重なり位置検出
⑦
S106
S306
補正処理
⑧
終了

[(1): Begin; (2): Input image memory; (3): RGB multivalent image?; (4): RGB multivalent image binarization routine; (5): Monochrome multivalent image binarization routine; (6): Direction detection or overlap position detection; (7): Calibration routine; (8): End]

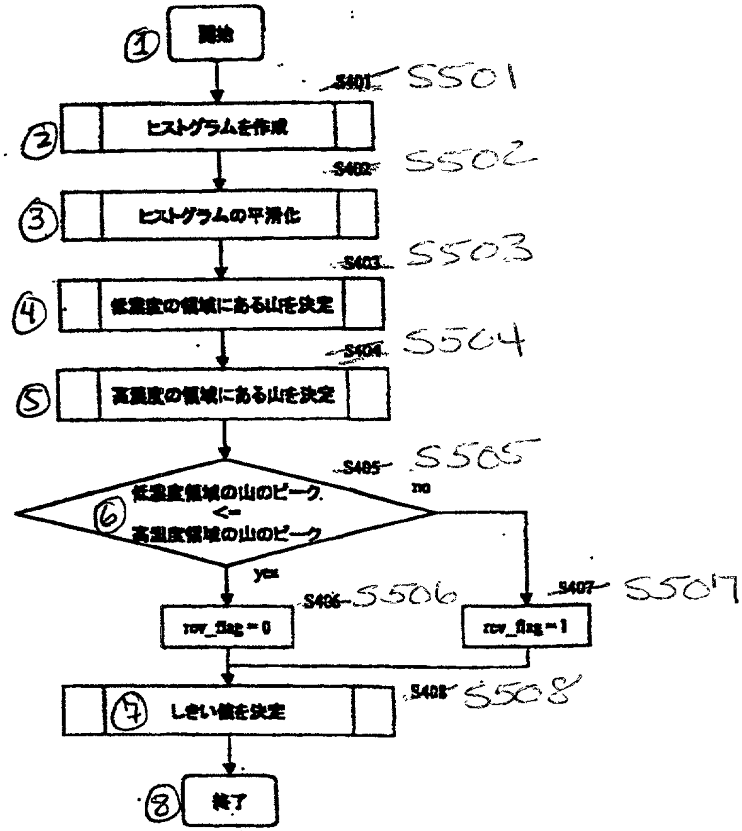
Figure 17



1
開始
2
S201
S401
しきい値 thresh[0]
色反転フラグ rev_flag[0]
R成分
10
3
S202
S402
しきい値 thresh[1]
色反転フラグ rev_flag[1]
G成分
11
4
S203
S403
しきい値 thresh[2]
色反転フラグ rev_flag[2]
B成分
12
5
S204
S404
反転画像か否かを判別
判別定数 a
6
S205
S405
白黒反転？
yes
no
7
S206
S406
2値化処理
8
S207
S407
2値化処理(反転対応)
9
終了

[(1): Begin; (2): Threshold value thresh [0] and color permutation flag rev flag [0]; (3): Threshold value thresh [1] and color permutation flag rev flag [1]; (4): Threshold value thresh [2] and color permutation flag rev flag [2]; (5): Judgment of image permutation or lack thereof, judgment constant a; (6): White/black permutation?; (7): Binarization routine; (8): Binarization routine (in response to permutation); (9): End; (10): Component R; (11): Component G; (12): Component B]

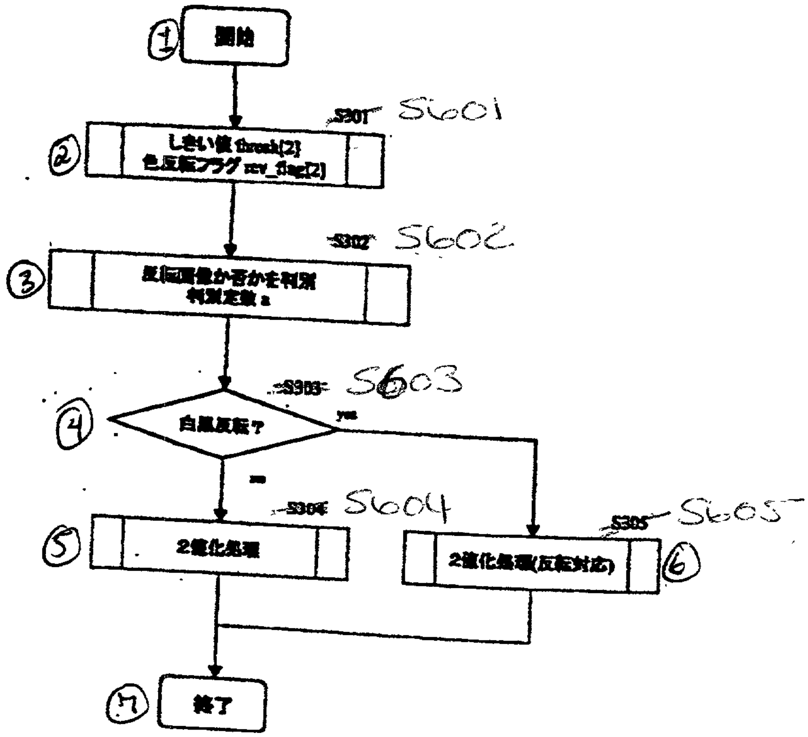
Figure 18



①
開始
~~S401~~ S501
②
ヒストグラムを作成
~~S402~~ S502
③
ヒストグラムの平滑化
~~S403~~ S503
④
低濃度の領域にある山を決定
~~S404~~ S504
⑤
高濃度の領域にある山を決定
~~S405~~ S505
⑥
低濃度領域の山のピーク
<=
高濃度領域の山のピーク
no
yes
~~S406~~ S506
rcv_flag = 0
~~S407~~ S507
rcv_flag = 1
~~S408~~ S508
⑦
しきい値を決定
⑧
終了

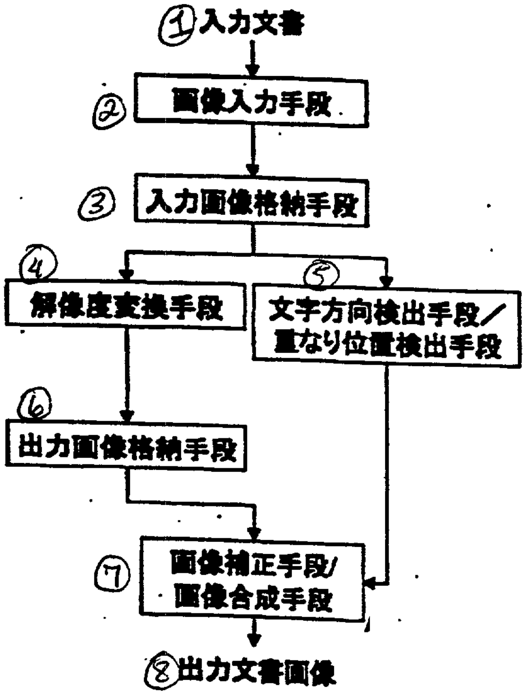
[(1): Begin; (2): Histogram preparation; (3): Histogram flattening; (4): Selection of a low-density region peak; (5): Selection of a high-density region peak; (6): Low-density region peak. high-density region peak ; (7): Threshold value determination; (8): End]

Figure 19


1
開始
~~S301~~ S601
2
しきい値 thresh[2]
色反転フラグ rev_flag[2]
~~S302~~ S602
3
反転画像か否かを判別
判別定数 a
~~S303~~ S603
4
白黒反転？
yes
no
~~S304~~ S604
5
2値化処理
~~S305~~ S605
2値化処理(反転対応)
6
7
終了

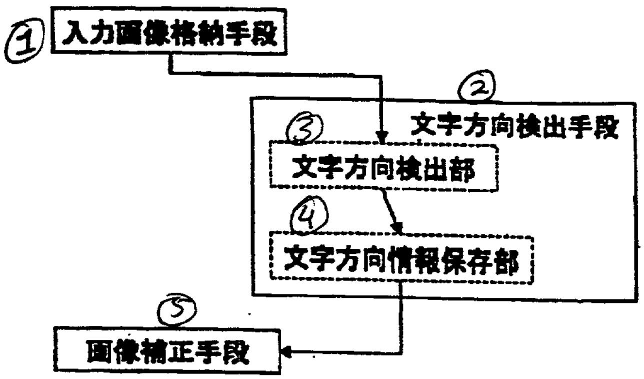
[(1): Begin; (2): Threshold value thresh [2] and color permutation flag rev flag [2]; (3): Judgment of image permutation or lack thereof, judgment constant a; (4): White/black permutation?; (5): Binarization routine; (6): Binarization routine (in response to permutation); (7): End]

Figure 20


①入力文書
②画像入力手段
③入力画像格納手段
④解像度変換手段
⑤文字方向検出手段／重なり位置検出手段
⑥出力画像格納手段
⑦画像補正手段/画像合成手段
⑧出力文書画像

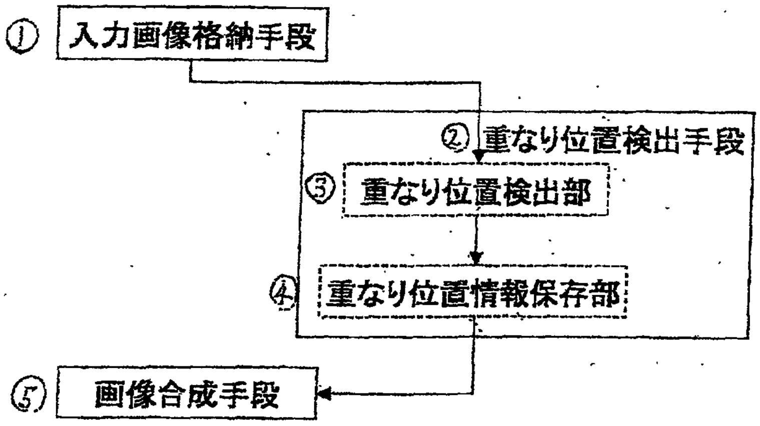
[(1): Input document; (2): Image input mechanism; (3): Input image storage mechanism; (4): Resolution conversion mechanism; (5): Character direction detection mechanism/overlap position detection mechanism; (6): Output image storage mechanism; (7): Image calibration mechanism/image synthesis mechanism; (8): Output document image]

Figure 21


①
入力画像格納手段
②
文字方向検出手段
③
文字方向検出部
④
文字方向情報保存部
⑤
画像補正手段

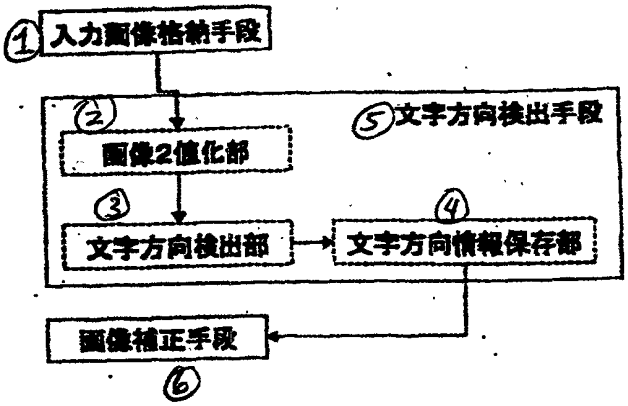
[(1): Input image storage mechanism; (2): Character direction detection mechanism; (3): Character direction detection unit; (4): Character direction information storage unit; (5): Image calibration mechanism]

Figure 22


① 入力画像格納手段
② 重なり位置検出手段
③ 重なり位置検出部
④ 重なり位置情報保存部
⑤ 画像合成手段

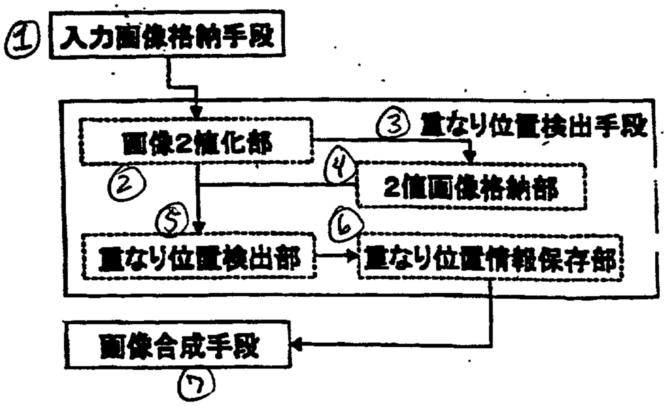
(1): Input image storage mechanism;
(2): Overlap position detection mechanism;
(3): Overlap position detection unit;
(4): Overlap position information storage unit;
(5): Image synthesis mechanism

Figure 23


1 入力画像格納手段
2 画像2値化部
5 文字方向検出手段
3 文字方向検出部
4 文字方向情報保存部
画像補正手段 6

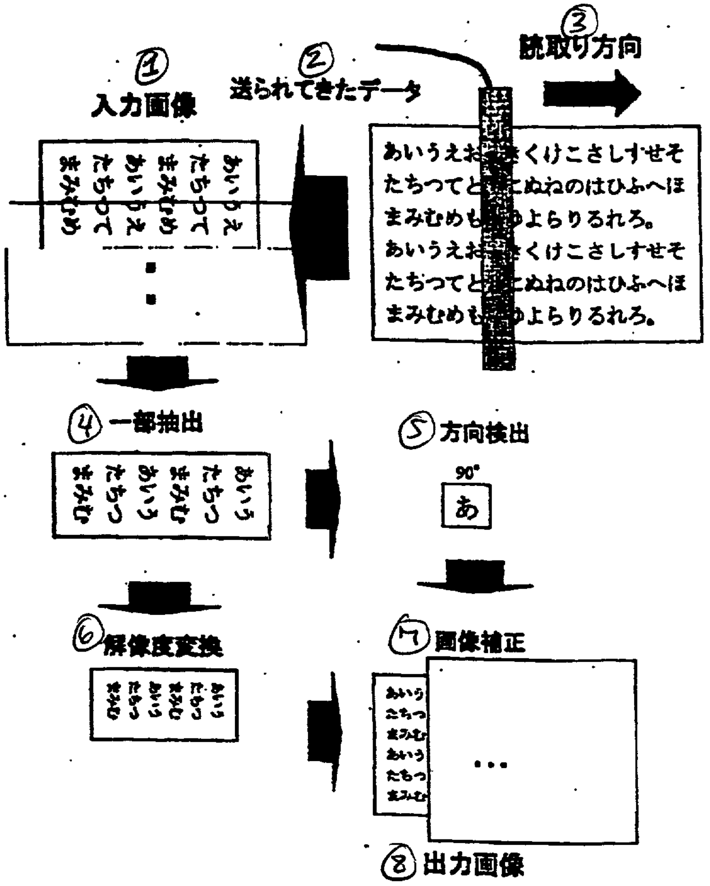
[(1): Input image storage mechanism; (2): Image binarization unit; (3): Character direction detection unit; (4): Character direction information storage unit; (5): Character direction detection mechanism; (6): Image calibration mechanism]

Figure 24


① 入力画像格納手段
画像2値化部
②
③ 重なり位置検出手段
④
2値画像格納部
⑤
重なり位置検出部
⑥
重なり位置情報保存部
画像合成手段
⑦

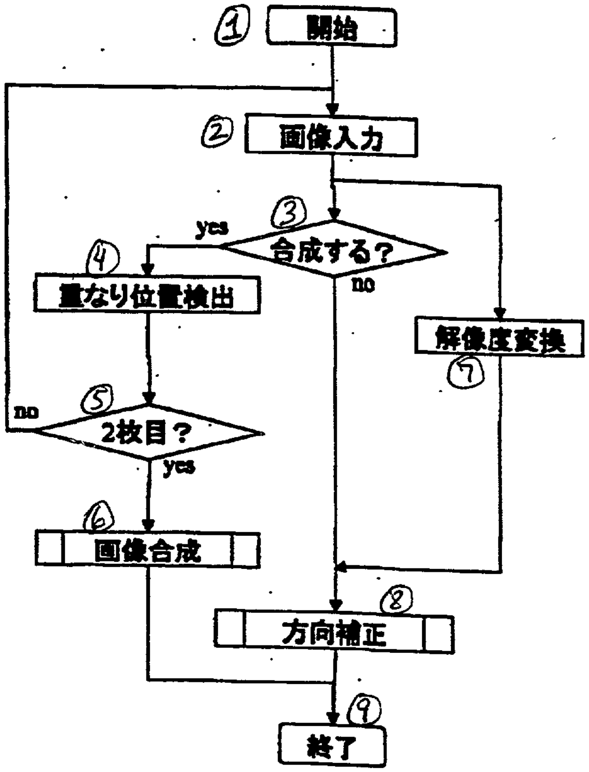
[(0): Input image storage mechanism; (2): Image binarization unit; (3): Overlap position detection mechanism; (4): Binary image storage unit; (5): Overlap position detection unit; (6): Overlap position information storage unit; (7): Image synthesis mechanism]

Figure 25


① 入力画像
② 送られてきたデータ
③ 読取り方向
④ 一部抽出
⑤ 方向検出
90°
あ
⑥ 解像度変換
⑦ 画像補正
⑧ 出力画像

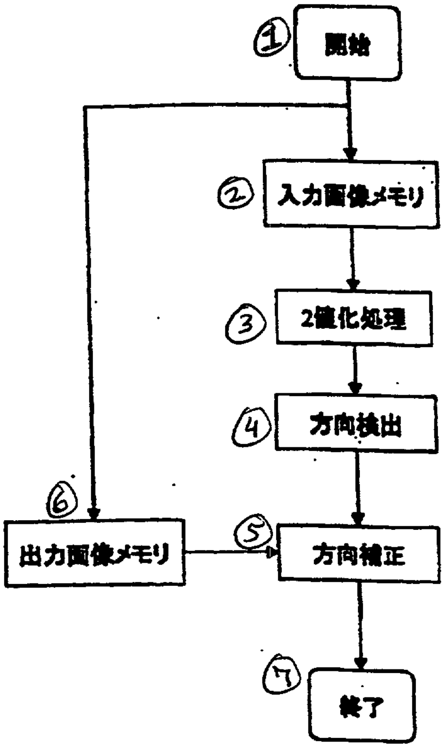
[(0): Input image; (2): Transferred data; (3): Decoding direction; (4): Partial extraction; (5): Direction detection; (6): Resolution conversion; (7): Image calibration; (8): Output image]

Figure 26


①
開始
②
画像入力
③
合成する？
yes
no
④
重なり位置検出
⑤
2枚目？
no
yes
⑥
画像合成
解像度変換
⑦
⑧
方向補正
⑨
終了

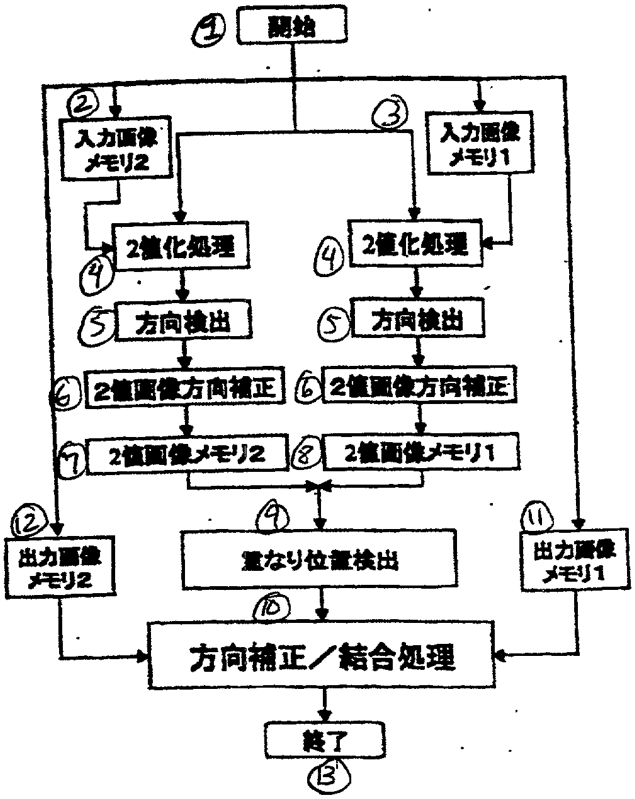
[(1): Begin; (2): Image input; (3): Synthesis?; (4): Overlap position detection; (5): Second?; (6): Image synthesis; (7): Resolution conversion; (8): Direction calibration; (9): End]

Figure 27


①
開始
②
入力画像メモリ
③
2値化処理
④
方向検出
⑥
出力画像メモリ
⑤
方向補正
⑦
終了

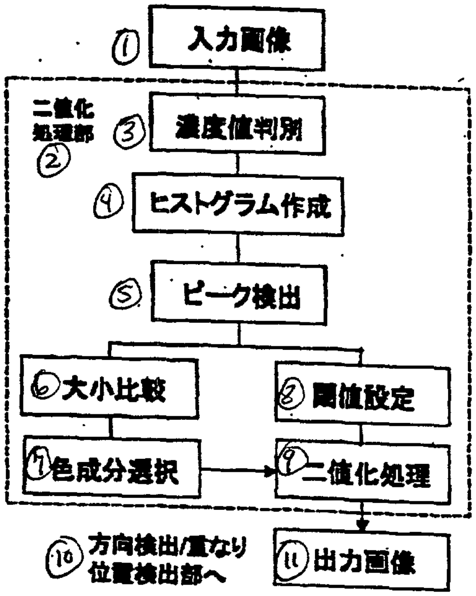
[(1): Begin; (2): Input image memory; (3): Binarization routine; (4): Direction detection; (5): Direction calibration; (6): Output image memory; (7): End]

Figure 28


①
開始
②
入力画像メモリ2
③
入力画像メモリ1
④
2値化処理
④
2値化処理
⑤
方向検出
⑤
方向検出
⑥
2値画像方向補正
⑥
2値画像方向補正
⑦
2値画像メモリ2
⑧
2値画像メモリ1
⑫
出力画像メモリ2
⑨
重なり位置検出
⑪
出力画像メモリ1
⑩
方向補正／結合処理
終了
⑬

[(1): Begin; (2): Input image memory 2; (3): Input image memory 1; (4): Binarization routine; (5): Direction detection; (6): Binarized image direction calibration; (7): ~~Binarized~~ BINARY image memory 2; (8): Binarized image memory 1; (9): Overlap position detection; (10): Direction calibration/synthesizing routine; (11): Output image memory 1; (12): Output image memory 2; (13): End]

Figure 29



①
入力画像
二値化
処理部
②
③
濃度値判別
④
ヒストグラム作成
⑤
ピーク検出
⑥
大小比較
⑧
閾値設定
⑦
色成分選択
⑨
二値化処理
⑩
方向検出/重なり
位置検出部へ
⑪
出力画像

[(1): Input image; (2): Binarization unit; (3): Density value judgment; (4): Histogram preparation; (5): Peak detection; (6): Hierarchical comparison; (7): Color component selection; (8): Threshold value designation; (9): Binarization routine; (10): To direction detection/overlap position detection unit; (11): Output image]